

Missouri Department of Natural Resources

Total Maximum Daily Load Information Sheet

Turkey Creek

Waterbody Segment at a Glance:

County: Jasper
Nearby Cities: Joplin
Length of impairment: 8.5 miles
Pollutant: Zinc
Source: Duenweg, Lone Elm and
Leadville Hollow Abandoned
Mine Lands (AMLs)



State map showing location of watershed

TMDL Priority Ranking: EPA Approved 2006

Description of the Problem

Beneficial uses of Turkey Creek

- Livestock and Wildlife Watering
- Protection of Aquatic Life (Warm-Water Fishery)
- Human Health Protection (Fish Consumption)
- Whole Body Contact Recreation

Use that is impaired

- Protection of Aquatic Life (Warm-Water Fishery)

Standards that apply

- Missouri's Water Quality Standards (WQS) for zinc may be found in 10 CSR 20-7.031 Table A. The applicable standard is hardness dependent and follows the formula:

Acute: $e^{(0.8473 \cdot \ln(\text{Hardness}) + 0.884211)} \cdot 0.978 = \mu\text{g/L}^1$ of Dissolved Zinc

Chronic: $e^{(0.8473 \cdot \ln(\text{Hardness}) + 0.785271)} \cdot 0.986 = \mu\text{g/L}$ of Dissolved Zinc

Using a hardness of 200 mg/L, the zinc target for the Turkey Creek watershed (as Missouri's chronic criterion) is 193 $\mu\text{g/L}$ as dissolved zinc. For comparison, Kansas' acute and chronic criteria are 216 $\mu\text{g/L}$ as total recoverable zinc.

Background Information and Water Quality Data

Lead-zinc AMLs produce runoff with high levels of dissolved zinc. Zinc is one of the most mobile of all heavy metals. Because compounds of zinc dissolve easily, zinc is carried into waterways during rain events. Zinc is an essential nutrient to aquatic and terrestrial organisms, but in excess it can be very toxic and has a tendency to bio-accumulate (build up) in aquatic organisms. The

¹ $\mu\text{g/L}$ = micrograms per liter, which is the same as parts per billion

hardness of the water, the amount of dissolved oxygen and temperature all affect the toxicity of zinc to aquatic life². Synergistic effects can also occur to increase the toxicity of the zinc. This means when several compounds are combined, the result is more toxic than what would be expected from just adding the components together. A number of behavioral and physiological effects have been reported when test organisms have been exposed to high levels of zinc. Behavior responses in fish include avoidance and changes in feeding rate and movement patterns. Physiological changes in fish include increased ventilation rates, frequency of coughing and a decrease in oxygen utilization.³

Two segments of Turkey Creek are on the 2002 303(d) List for high levels of zinc. Several AMLs provide zinc to Turkey Creek, with the Duenweg mining area being the most significant contributor in the upper Turkey Creek watershed. In the middle portion of the watershed, the Lone Elm Hollow and Leadville Hollow areas are the most significant sources. Zinc levels frequently exceed state WQS during low flow periods. See below for a map of the area and graphs summarizing the data. More recent data may be found in the assessment for the 2004-06 303(d) List found at: <http://www.dnr.mo.gov/env/wpp/waterquality/303d/2006pn/proposed-2006-303d-list-data.htm>

Turkey and [Center](#) creeks in Jasper County flow across the state line into the Spring River in Kansas. Kansas has completed a TMDL study on the Spring River and these two creeks are major sources of metals pollution in the Spring River. As a result, Missouri chose to include Kansas' WQS in the target for this TMDL. It should be noted that there are differences in the listing of pollutants between the two states. Kansas has the Spring River listed for cadmium, copper and lead in addition to zinc, which is all Missouri listed. This is due to differences between the two states' WQS and assessment data. This does not pose a conflict because any remediation plan that decreases the amount of zinc running off into these creeks will also reduce the loading of the other metals of concern in Kansas. It should be noted that Missouri's standards are expressed as dissolved zinc while Kansas expresses their standard as total recoverable zinc.

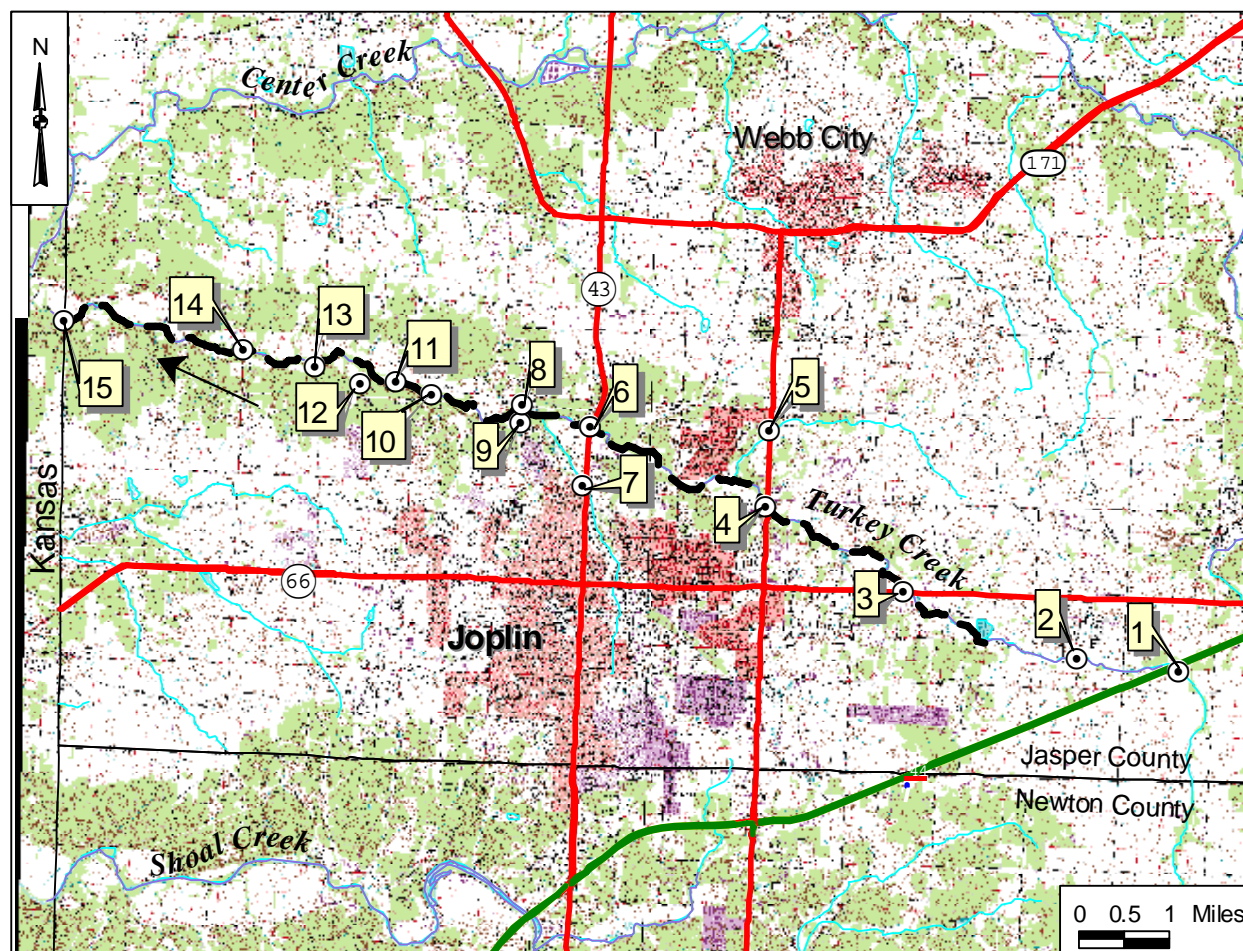
The old lead mining area in Jasper County has been designated as a Superfund Site. Restoration methods were evaluated through pilot projects in the watershed. The Potential Responsible Parties, the Environmental Protection Agency and the Missouri Department of Natural Resources funded these efforts. Remediation activities have included closing shafts, returning mined materials to the subsurface (subaqueous disposal) and preventing erosion by grading and revegetating chat piles. Water quality monitoring continues on a regular basis. In March 2005, an effort began that will enable all parties involved in cleaning up the Tri-State Area Mining District to work together to resolve the problems in this large area. The effort includes the departments of Natural Resources and Conservation in Missouri and their equivalents in Kansas, Oklahoma and nine Native American Tribes in Oklahoma, two EPA regions, U.S. Army Corps of Engineers districts, U.S. Geological Survey, and the U.S. Fish and Wildlife Service. This will reduce duplication of projects, give everyone access to all work that has already been completed, foster cooperation and make the clean up more efficient and cost effective.

The Environmental Protection Agency (EPA) approved these TMDLs on October 25, 2006.

² Upper Sacramento River TMDL for Metals, California Environmental Protection Agency, 9/25/01.
www.swrcb.ca.gov/rwqcb5/TMDL/upperSacCdCuZn.html

³ Red Clay Creek TMDL, Delaware Natural Resources and Environmental Control, 8/1/99.
www.dnrec.state.de.us/DNREC2000/Library/Water/rcctmdl.pdf

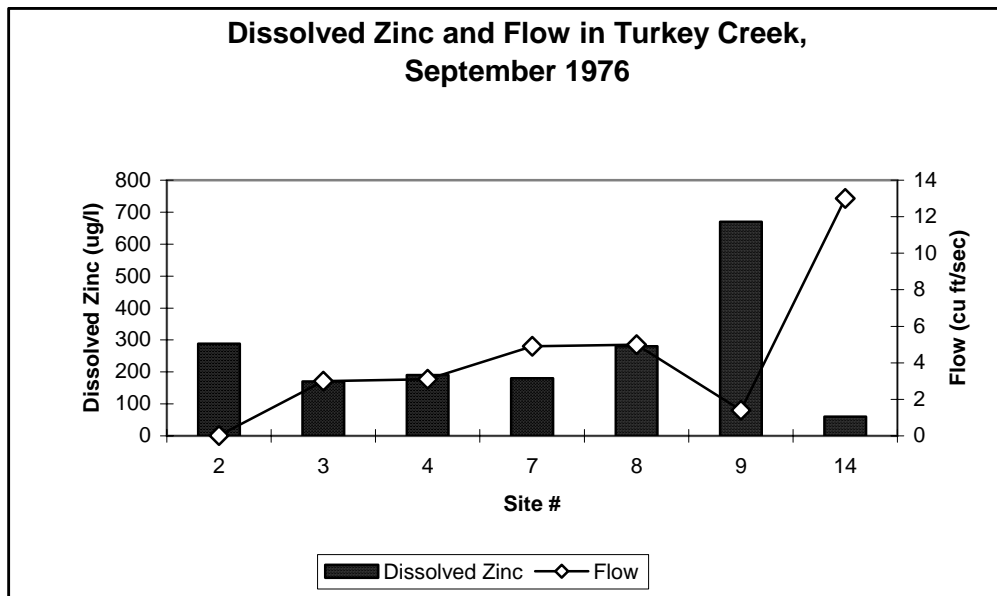
Turkey Creek in Jasper County, Missouri, with Sampling Sites



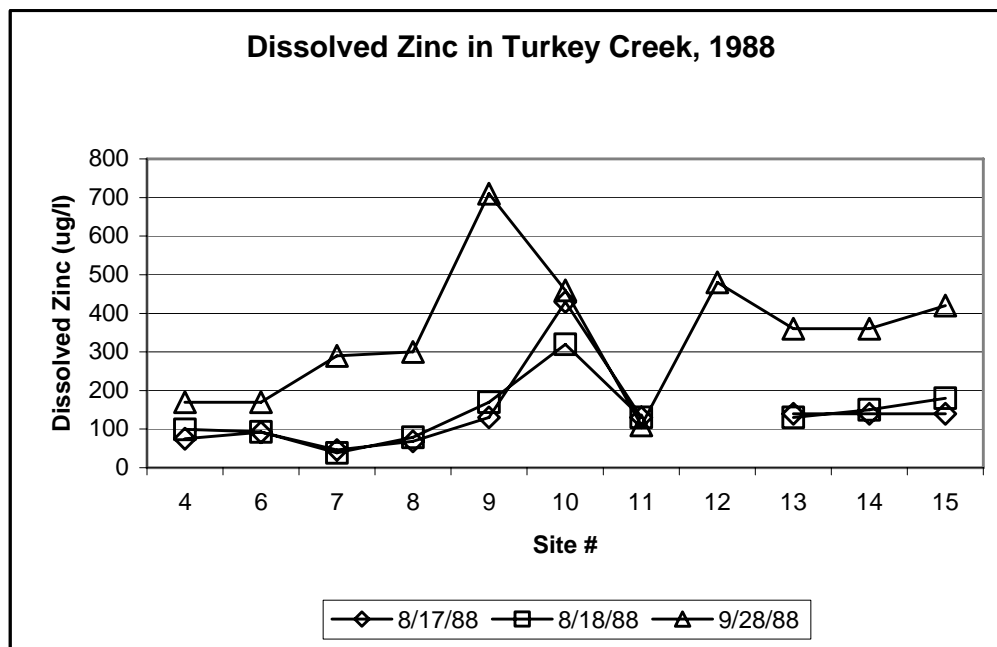
--- Impaired segment ← Direction of flow

Sample Site Index

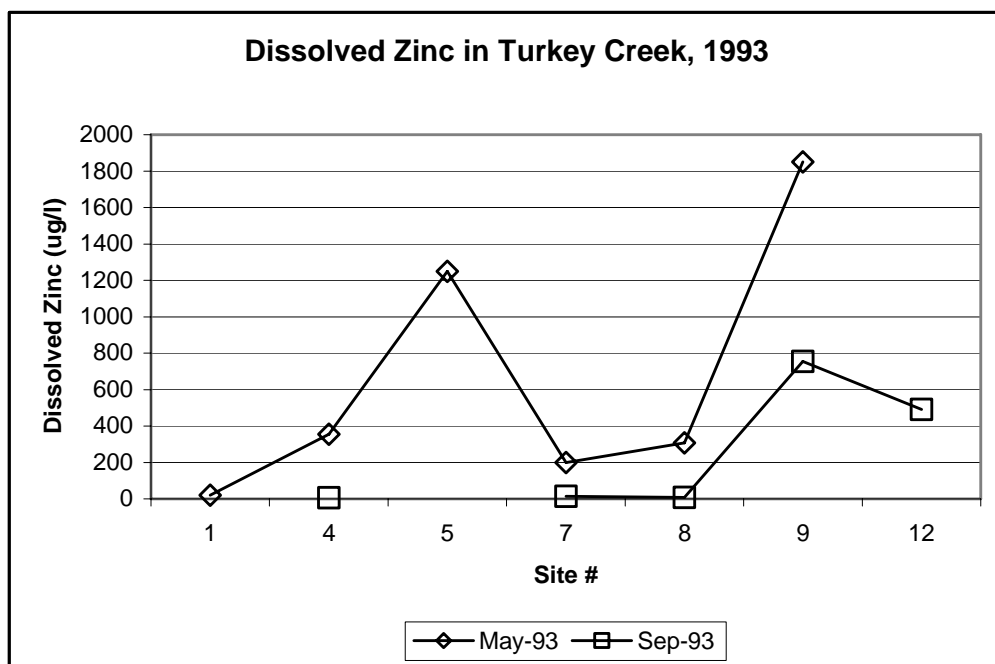
- 1 – Turkey Creek 1.2 miles above Duenweg
- 2 – Turkey Creek at Duenweg
- 3 – Turkey Creek 2.4 miles below Duenweg
- 4 – Turkey Creek 4.5 miles below Duenweg
- 5 – Tributary to Turkey Creek from Oakland Park
- 6 – Turkey Creek 0.6 miles above Joplin Creek
- 7 – Joplin Creek near mouth
- 8 – Turkey Creek below Joplin Creek and above Lone Elm Hollow
- 9 – Lone Elm Hollow near mouth
- 10 – Turkey Creek below Leadville Hollow and above Joplin Turkey Creek WWTP
- 11 – Joplin Turkey Creek WWTP
- 12 – Chitwood Hollow near mouth
- 13 – Turkey Creek 1 mile below Joplin Turkey Creek WWTP
- 14 – Turkey Creek at Highway P, 3.6 miles below Lone Elm Hollow
- 15 – Turkey Creek 4.9 miles below Joplin Turkey Creek WWTP



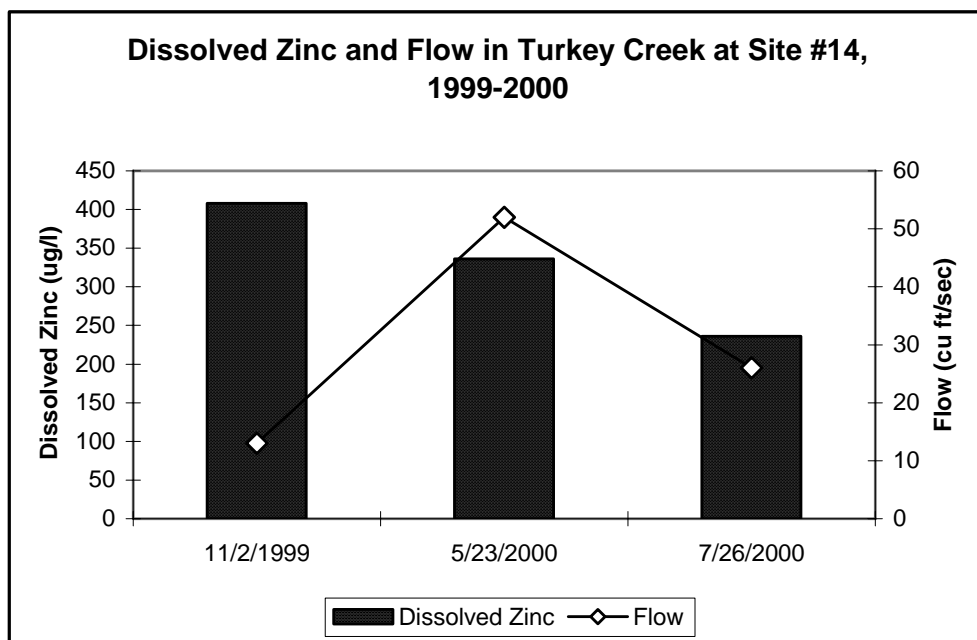
Source: U.S. Geological Survey



Source: Missouri Department of Natural Resources



Source: U.S. Environmental Protection Agency



Source: U.S. Geological Survey

For more information call or write:

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